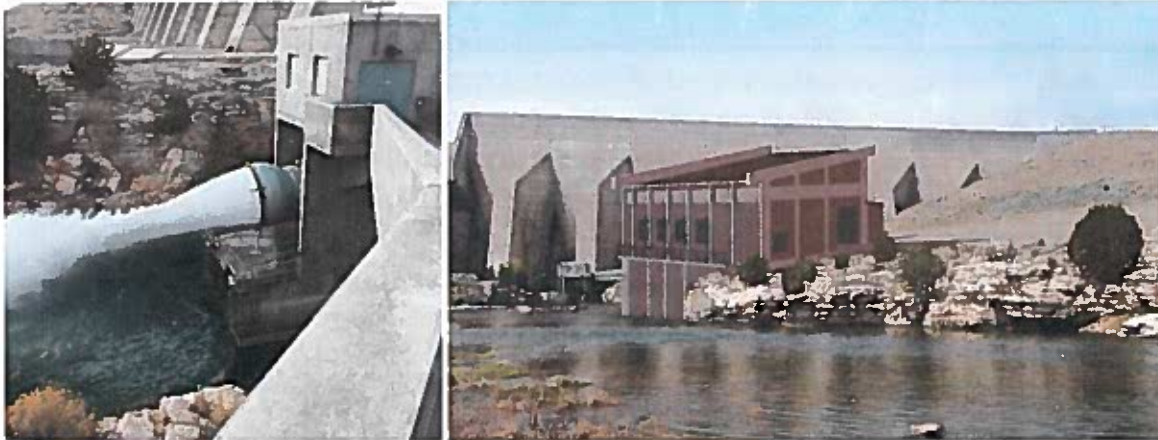




**PUEBLO DAM HYDROELECTRIC PROJECT
LOAN FEASIBILITY STUDY**
Submitted to the Colorado Water Conservation Board

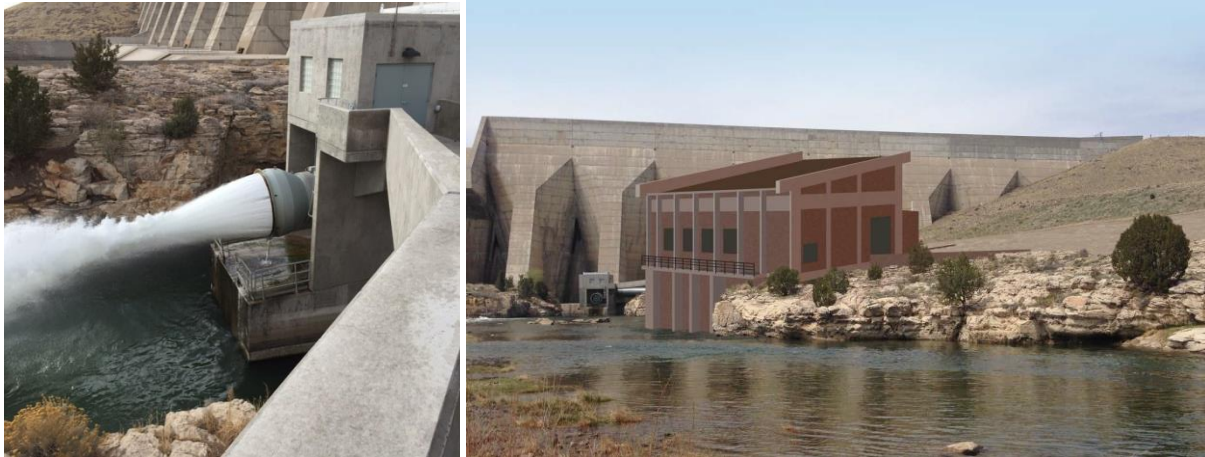
Contact: Kevin Meador, P.E.
Southeastern Colorado Water Conservancy District
31717 United Avenue
Pueblo, Colorado 81001
Phone: 720-252-4205
Fax: 719-948-0036
kevin@secwcd.com

FEASIBILITY STUDY APPROVAL
Pursuant to Colorado Revised Statutes 37-60-121 & 122, and
in accordance with policies adopted by the Board, the
CWCB staff has determined this Feasibility Study meets all
applicable requirements for approval.

Signed

7/8/2016
Date

June 1, 2016



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Executive Summary

Southeastern Colorado Water Conservancy District acting through its Water Activity Enterprise and in partnership with Colorado Springs Utilities (SU) and Board of Water Works of Pueblo (BWWP) is requesting a loan of up to \$20,000,000 for construction of the 7.5 Megawatt Pueblo Dam Hydroelectric Project. This project will be located at the existing Pueblo Dam and will utilize the existing releases to the Arkansas River. The facility will include three Francis turbines (1-4,000 kilowatt, 1-2,600 kilowatt, and 1-900 kilowatt). The project will generate an average of 28.0 Million kilowatt-hours of clean renewable energy which will be purchased by Colorado Springs Utilities via transmission through the local Black Hills Energy power delivery system. The estimated completion date is January, 2018.

Background

Purpose and Study Area Description

The purpose of the Pueblo Dam Hydroelectric Project (PDHP) is to take advantage of the favorable site conditions for hydropower development located at Pueblo Dam. A 2011 Hydropower Resource Assessment report prepared by the U.S. Bureau of Reclamation (Reclamation) identified Pueblo Dam as the most favorable site for hydropower development out of all of Reclamation's facilities in Colorado. Pueblo Dam is a 357,678-acre-foot facility located 6 miles west of Pueblo. It is owned and operated by the U.S. Bureau of Reclamation (Eastern Colorado Area Office, Loveland, CO). The reservoir is part of the Fryingpan-Arkansas Project which was authorized in 1962.

The proposed 7.5 megawatt (MW) hydroelectric facility would be located on the Pueblo Dam River North Outlet (See Figure 1). A powerhouse would be located at the downstream end of the existing outlet works that supplies water to the Arkansas River and would allow the Dam's authorized releases to generate an annual average 28.0 million kilowatt hours (kWh) and \$1,500,000 in average revenue per year. The project's total capital cost is estimated to be \$18.4 million. This study is intended to demonstrate the feasibility of the project.



Figure 1
Site Location

Previous Studies

Three previous studies were completed to address the feasibility of the project. They included:

- Hydropower Feasibility Update, Pueblo Dam Hydroelectric project dated March 21, 2014, CH2MHill
- Draft Design Documentation Report Preliminary Design, Pueblo Dam Hydroelectric Project dated June, 2014, CH2MHill
- Design Proposal, Pueblo Dam Hydroelectric Project dated May 2, 2016, Mountain States Hydro, LLC

Information and results presented in these studies will be referenced in this Loan Feasibility Study.

Project Sponsor

The Southeastern Colorado Water Conservancy District was created under Colorado State Statutes on April 29, 1958 by the District Court of Pueblo, Colorado for the purpose of developing and administering the Fryingpan-Arkansas Project. The District extends along the Arkansas River from Buena Vista to Lamar, and along Fountain Creek from Colorado Springs to Pueblo, Colorado. The District consists of parts of nine counties deriving benefits from the Fryingpan-Arkansas Project. In 1965, the U.S. Department of Interior, Bureau of Reclamation and the SECWCD entered into a contract providing construction of the Fryingpan-Arkansas Project for the purpose of supplying water for irrigation,

municipal, domestic, and industrial uses; generating and transmitting hydroelectric power and energy; controlling floods; and for other useful and beneficial purpose.

SECWCD is responsible to repay the portion of their construction cost of the Fryingpan-Arkansas Project plus their cost for annual operation and maintenance. Since the Fryingpan-Arkansas Project provides many benefits to all individuals, the project is also paid for by the taxpayer. Funding to fulfill this obligation to the federal government is derived from a property tax on all property within the SECWCD boundaries.

The SECWCD will own, maintain, and operate the PDHP facilities through the Southeastern Colorado Water Activity Enterprise (Enterprise). The governing body of the Enterprise is the SECWCD Board of Directors. SECWCD is the sole owner of the Enterprise. It is the intent of the Enterprise to contract operations and maintenance of the facilities with its PDHP partner, SU. SU currently operates and maintains four existing hydropower facilities within its service area.

LOPP Process

As a result of the 2011 Hydropower Resource Assessment, Reclamation released a Lease of Power Privilege (LOPP) solicitation on April 20, 2011. Based on a proposal and evaluation process, a partnership consisting of the Southeastern Water Conservancy District (SECWCD), the Board of Water Works of Pueblo (BWWP), and Colorado Springs Utilities (SU) was issued a preliminary permit on February 27, 2012. The permit allowed for continued evaluation of the technical, environmental, and economic feasibility of the project over a two-year period. Due to the project complexities and challenges in negotiating interconnection and power purchase terms five six month extensions have been granted to the project. Technical and feasibility evaluations have been completed. The environmental assessment permitting process, led by Reclamation, has been completed. Initial Letter of Intent to purchase power have been obtained. The final power purchase and interconnection agreements are expected to be completed by summer of 2016. All of the activities are anticipated to be complete and a final LOPP issued by September, 2016.

Project Description

The proposed PDHP will be located on the existing Pueblo Dam River North Outlet. Two existing pipeline turnout connections exist on Reclamation's outlet pipe for the hydroelectric facility. The powerhouse will be located approximately 500 feet downstream from the North Outlet Work's fixed cone valve facility and adjacent to a Reclamation water supply pipeline. The hydroelectric turbines will discharge into the Arkansas River below Pueblo Dam. The powerhouse will include three horizontal-shaft Francis-type hydroelectric turbines with synchronous generators. The generators will be rated 3-phase, 60 hertz (Hz) at 4160 volts (V). Generated electric power will be transmitted over an underground 13.2 kV transmission line from the power plant substation to an existing Black Hills Energy (BHE) distribution substation south of the Arkansas River about 6000 feet from the powerplant. The project is being performed under Reclamation's LOPP process. The project will utilize the existing outlet flows from Pueblo Dam and will act as a run-of-river plan with no changes to the dam releases.

Hydrology

In order to establish a basis for the design of hydroelectric turbine generators to be installed at the project, a basis for the flow and net head available to the equipment was developed. The basis for flow and net head available includes both technical and future operation projections, which are discussed in this section.

Quantification and qualification of flow available to this hydropower facility are based on the following data and criteria:

- Historical daily average Arkansas River flows below Pueblo Dam as recorded at the Colorado Department of Water Resources Station: ARKPUECO.07099400 ARKANSAS RIVER ABOVE PUEBLO, CO – October 1, 1983 through December 31, 2013.
- The maximum capacity of the River Outlet Works through the Pueblo Dam Connection is 1,120 cfs (based on previous work performed during design of the SDS Pueblo Dam Connection). If river demands greater than 1,120 cfs are required to be discharged through Pueblo Dam, flows above 1,120 cfs are passed by means of the dam's three spillway gates.
- Flow through the 90-inch Reclamation pipeline to meet participant ultimate demands total 399 cfs. Of the 399 cfs, SDS and Pueblo West ultimate demands total 148 cfs. It is assumed that normal operating capacity reserves in the Reclamation Pipeline only need to consider SDS and non-redundant Pueblo West demands. Redundant demands would be supplied solely during emergency conditions in the event the South Outlet Works experiences an outage and therefore are not considered factors in sizing the hydroelectric equipment.
- Projected SDS and Pueblo West demands on water supplied from Pueblo Reservoir require a flow reduction be applied to historical Arkansas River streamflow data when used to project future flow available to the PDHP.
- Hydraulic analyses performed by CH2M HILL indicate a Forebay elevation of 4824.0 ft provides sufficient hydraulic head to deliver the following flows: 120 cfs to the Juniper Pump Station, 28 cfs to Pueblo West Pump Station, and 735 cfs to the hydroelectric plant. If the flows to the Juniper Pump Station and/or Pueblo West Pump Station are less than the 148 cfs projected, then the flows to the PDHP could be increased to a maximum of 850 cfs.
- Maximum allowable water velocity in the 90-inch Reclamation Pipeline was established during design of the SDS Pueblo Dam Connection to be 20 ft/sec, or 883 cfs. Thereby, the maximum allowable flow to the hydropower plant is 735 cfs (883 cfs minus 120 cfs {SDS} minus 28 cfs {PW}). The Reclamation Pipeline and 66-inch hydroelectric facility turnouts are lined with Seaguard 6000 Epoxy, tie coat, and surface coat.
- Maximum allowable velocity in each 66-inch turnout for the hydroelectric plant is assumed to be 30 ft/sec (712 cfs).
- No additional demands beyond stated SDS, Pueblo West, and redundant flows were considered.

- The minimum streamflow in the Arkansas River below Pueblo Dam is 20 cfs to meet the demands of the State Fishery. Typically, flow is maintained above 50 cfs during low flow months. Design of the fixed cone valve constructed in 2012 assumed a minimum release 50 cfs throughout the year. Preliminary tailwater elevation is based upon this 50 cfs figure.

Quantification and qualification of available net head at the PDHP turbines is based on:

- The head duration curve is shown in Figure 2 and the minimum and maximum net head variation (1985-2013) is shown in Figure 3.
- Historical daily Pueblo Reservoir Forebay Elevations from Reclamation's Great Plains Region Hydromet, Station PUER – October 1, 1983 through December 31, 2013
- SDS Environmental Impact Statement (EIS) discussion of effects to future Pueblo Dam Forebay levels projected the following: 1) Existing to No Action, the reservoir level would be reduced an average 3.8 ft, and 2) No Action to Proposed Action, the reservoir level would be reduced an additional 2.6 ft between 2016 and 2050. Overall, the proposed action will result in an average reduction of reservoir water surface levels of 6.4 ft between 2016 and 2050 (Reference: Final EIS, Appendix E - Simulated Hydrology Results, page E-38; Monthly WSEL Summary, Direct Effects, Location: Pueblo Reservoir). As a result, a linearly decreasing correction factor is applied to historical reservoir elevations for use in projected energy production formulas.
- The tailwater energy grade elevation (water surface elevation plus velocity head) was estimated using the United States Army of Corps of Engineers one-dimensional hydraulic model, Hydrologic Engineering Center River Analysis System (HEC-RAS) version 4.1.0.

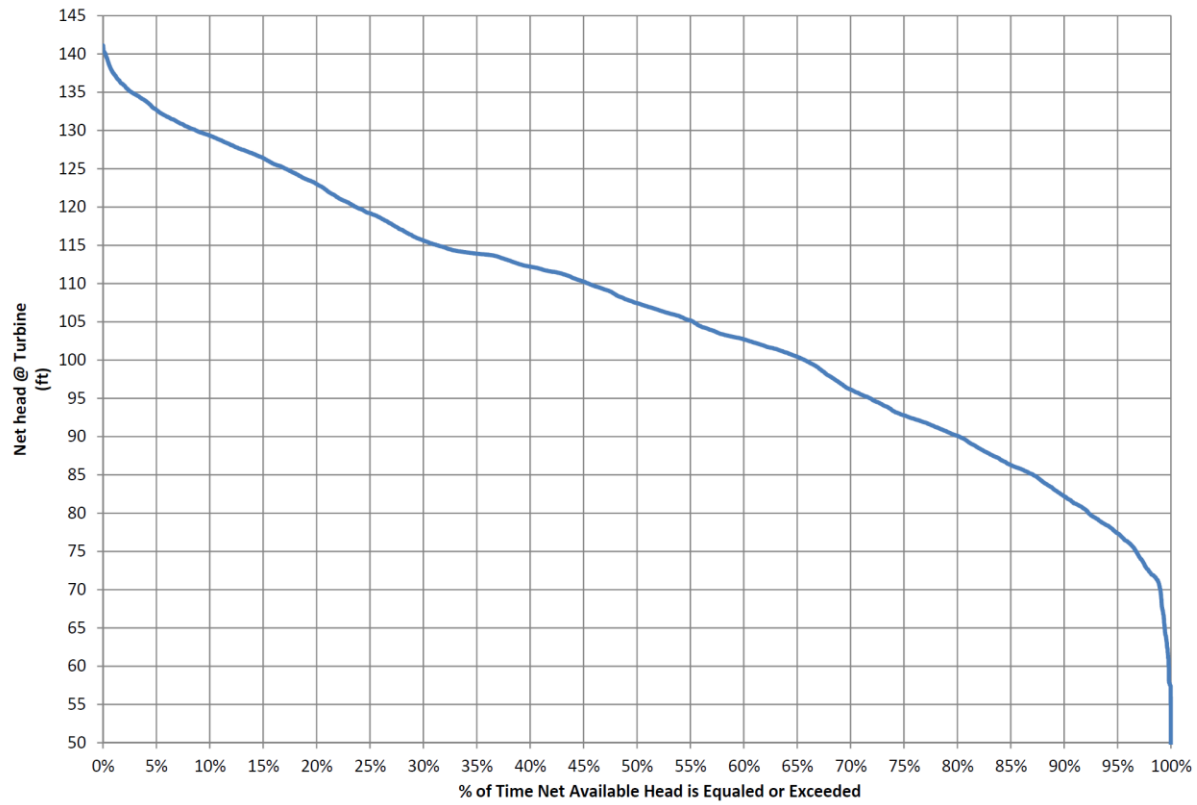


Figure 2
Head Duration Curve

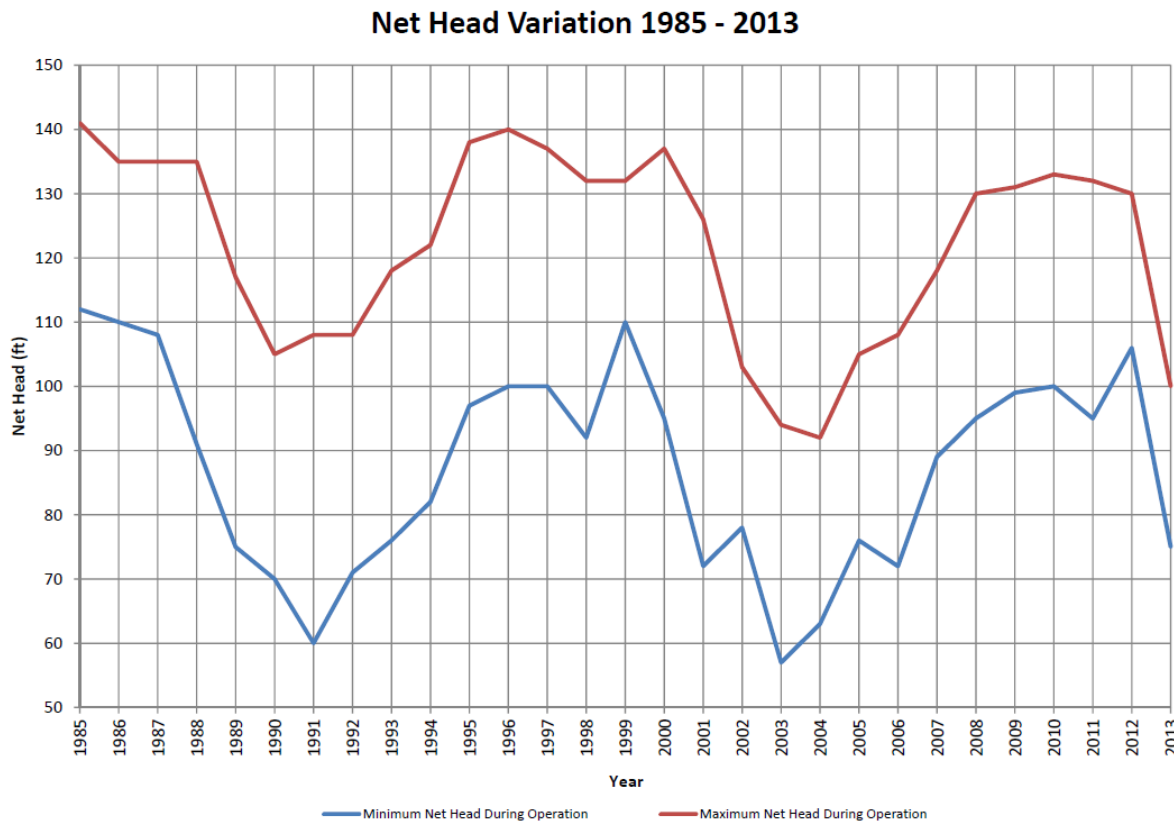


Figure 3
Net Head Variation 1985-2013

Environmental Impacts

The project will have negligible impacts on the environment. Reclamation has completed an environmental assessment (EA) for the project. As a part of the EA, reviews were conducted by various state and local agencies. A Finding of No Significant Impact (FONSI) is anticipated to be signed by early June, 2016. A Pueblo County 1041 permit FONSI approval was obtained in December, 2014. A U.S. Corps of Engineers 404 nationwide permit was granted for the work in the Arkansas River during construction. Based on input from U.S. Fish and Wildlife there are no endangered species impacted by the project.

Alternative Analysis

CH2MHill, Mountain States Hydro, and SECWCD performed alternative analyses for potential turbine sizing. Since the turnouts for the facility are already constructed, the facility site location is set.

Hydropower turbine systems are specialized equipment and are most often of custom design. This design application requires close consultation with manufacturers. The selection and sizing of the hydropower

equipment system is an iterative process. Site characteristics and general design concepts must be developed and analyzed with engineering judgment in order to provide a basis for manufacturer evaluation. In turn, a manufacturer's preliminary design typically requires the installation concept to be adapted to their equipment. In order to optimize energy production, turbine-generator equipment is selected and sized according to the available hydraulic conditions, including variability in flow and head. In consultation with various turbine manufactures, coupled with an understanding for operating conditions, relative costs, installation requirements and equipment efficiency, it was determined that horizontal Francis-type turbines should be employed at the site.

To determine the optimum equipment size and combination to maximize energy production, a number of different scenarios were developed and evaluated. The evaluations were conducted by developing multiple scenarios that employed either equally sized turbines or unequally sized turbines.

Equally Sized Versus Unequally Sized Units

Certain disadvantages are typically associated with selecting equipment of unequal size. The advantage of selecting unequally sized units is the ability to more effectively capitalize on a variable hydrograph by employing the lower flow reach of a smaller unit while covering the same total rated flow range as equally sized machines. If the added energy production from reaching lower into a site's hydrograph compensates for certain disadvantages of employing unequal size units, such an installation can be preferred. Disadvantages of employing unequally sized units include:

- Different spare parts and tools to operate and maintain the equipment.
- Varying maximum and minimum head requirements causing more complex management of the facility.
- Civil works are designed to accommodate the larger unit, typically causing a lower turbine and draft tube floor (i.e., deeper excavation, taller building, longer and deeper tailrace, etc.) as compared to equally sized units of the same total rated flow capacity.

The disadvantages presented above appear manageable for the Pueblo Hydroelectric Project and are offset by the estimated energy benefit of selecting an unequally sized unit combination over an equally sized unit combination.

Preliminary Constant-Speed Equipment Selection

As discussed above, unequally sized units appear to provide the higher energy benefit. The use of Turbine No. 1 at 450 cfs, Turbine No. 2 at 260 cfs, and Turbine No. 3 at 100 cfs would yield an estimated average annual energy production of 28,000,000 kWh. On this basis, the preliminary selection of the three turbine arrangement is recommended to provide the most energy generation potential over the widest range of flows. These selections will be further refined during final design.

Horizontal Generation Units Option

1. Basic Data

	Large Generator		Small Generator
	Large Turbine	Medium Turbine	Small Turbine
Rated Head	110 ft	110 ft	110 ft
Maximum Head	130	130	130
Minimum Head	70	70	70
Rated Flow	158-450 cfs	91-260 cfs	35-100 cfs

2. Turbine

Type	Horizontal Francis	Horizontal Francis	Horizontal Francis
Runner Diameter D ₁	1380 mm	1050 mm	880 mm
Rated Speed	327.3 rpm	450 rpm	450 rpm
Runaway Speed	665 rpm	875 rpm	875 rpm
Cavitation σ_c	0.135	0.135	0.05
Turbine Setting	Above TWL 2.0m	Above TWL 2.0 m	Above TWL 2.0 m
Weight of Runner	2000 kg	1000 kg	700 kg
Weight of Elbow	4000 kg	2000 kg	1200 kg

3. Generator

Type	Horizontal Synchronous	Horizontal Synchronous
Rated Capacity	4444 kVA	3889 kVA
Rated Power	4000 kW	3500 kW
Rated Voltage	4160 V	4160 V
Rated Current	616.8 A	539.7 A
Rated Speed	327.3 rpm	450 rpm
Runaway Speed	665 rpm	875 rpm
Power Factor	0.9	0.9
Frequency	60 Hz	60 Hz
Rated Efficiency	96.0%	96.0%
Exciting System	Static	Static

Project Components

The PDHP will include the following components:

- Connection to the existing North Outlet Works turnouts.
- 125 feet of 73-inch diameter penstock.
- Two Francis turbines with associated generators and electrical gear.
- A 75 foot by 100-foot power house located along the bank of the Arkansas River.
- 6,100 feet of underground and overhead powerline and associated switchgear to connect to Black Hills Energy.

Figure 4 shows the overall project layout. Figures 5 and 6 show a layout of the hydroelectric facility in plan and profile view, respectively.



Figure 4
Site Location

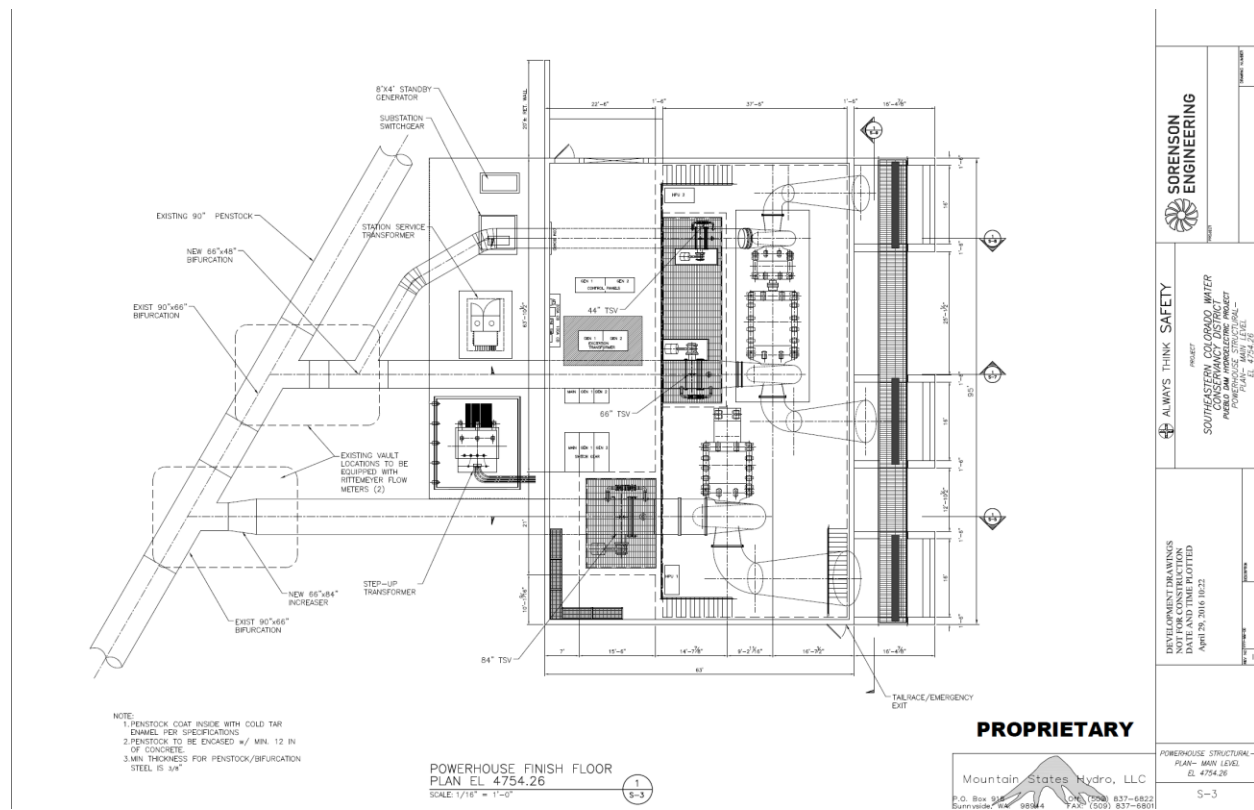


Figure 5
Powerplant Plan

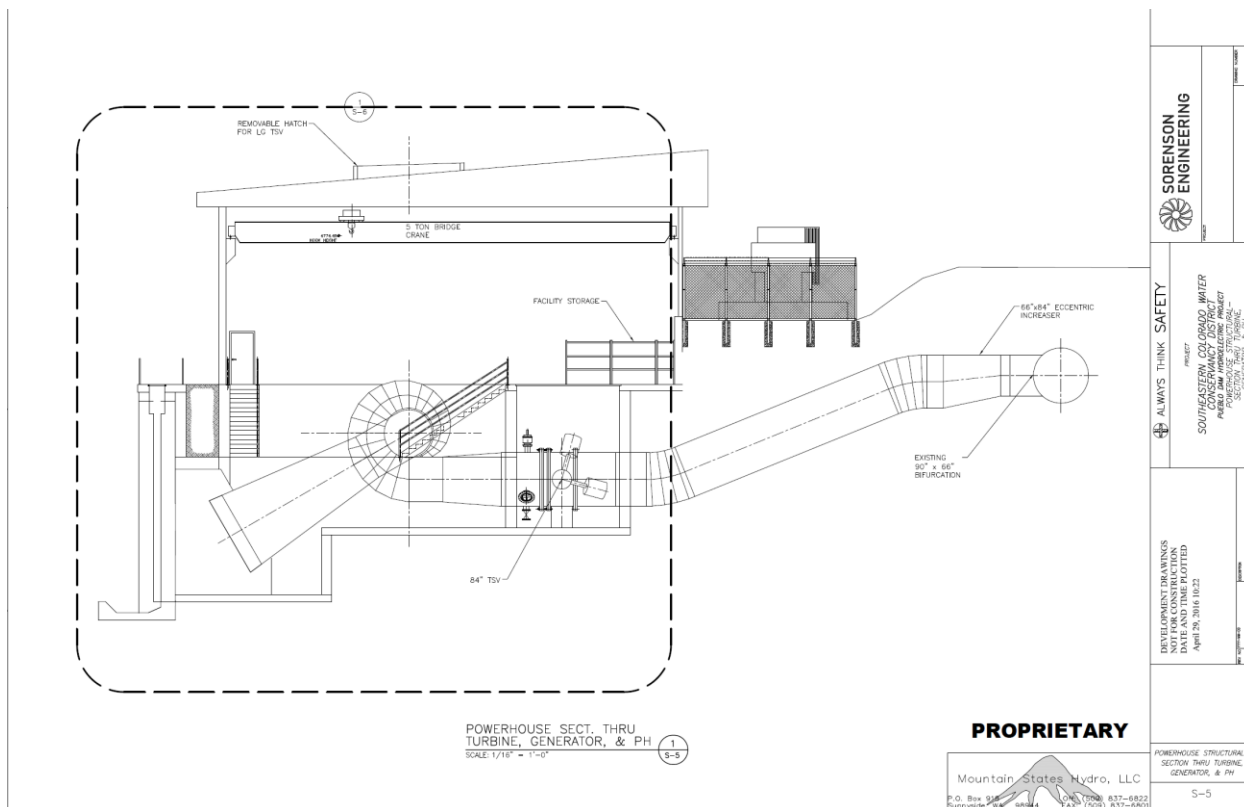


Figure 6
Powerplant Profile

Energy Generation

Energy production of the hydroelectric facility will vary widely because of the projected variation in heads and flow at the site. Additionally, the future energy production is dependent on the application of certain projected reductions because of planned changes in Forebay operations and demands from SDS and Pueblo West. This section presents energy production results with various assumptions based on the methodology previously presented and preliminary equipment selection.

Table 1 below presents the annual energy production for each calendar year of record (1984 – 2013) with adjustment to both available flow because of future SDS and Pueblo West demands and Forebay levels because of future changes in operation of Pueblo Reservoir. Figure 7 shows the average monthly production. The table below is based on the assumption that January 1, 1984, is projected to January 1, 2017.

Table 1

**Annual Energy Production with Reductions for Future Flow Demands of
SDS and Changes to Pueblo Reservoir Operation**

Pueblo Dam Hydroelectric Project

Year	Analysis Year	Annual kWh Production
1984	2017	43,013,000
1985	2018	52,654,000
1986	2019	49,510,000
1987	2020	45,654,000
1988	2021	35,122,000
1989	2022	29,144,000
1990	2023	23,150,000
1991	2024	21,638,000
1992	2025	28,098,000
1993	2026	29,428,000
1994	2027	30,639,000
1995	2028	38,784,000
1996	2029	37,499,000
1997	2030	42,212,000
1998	2031	32,385,000
1999	2032	38,791,000
2000	2033	35,589,000
2001	2034	25,175,000
2002	2035	7,866,000
2003	2036	8,937,000
2004	2037	14,151,000
2005	2038	16,990,000
2006	2039	20,847,000
2007	2040	28,555,000
2008	2041	32,209,000
2009	2042	28,833,000
2010	2043	27,357,000
2011	2044	27,920,000
2012	2045	10,871,000
2013	2046	13,798,000
Average		28,246,0002

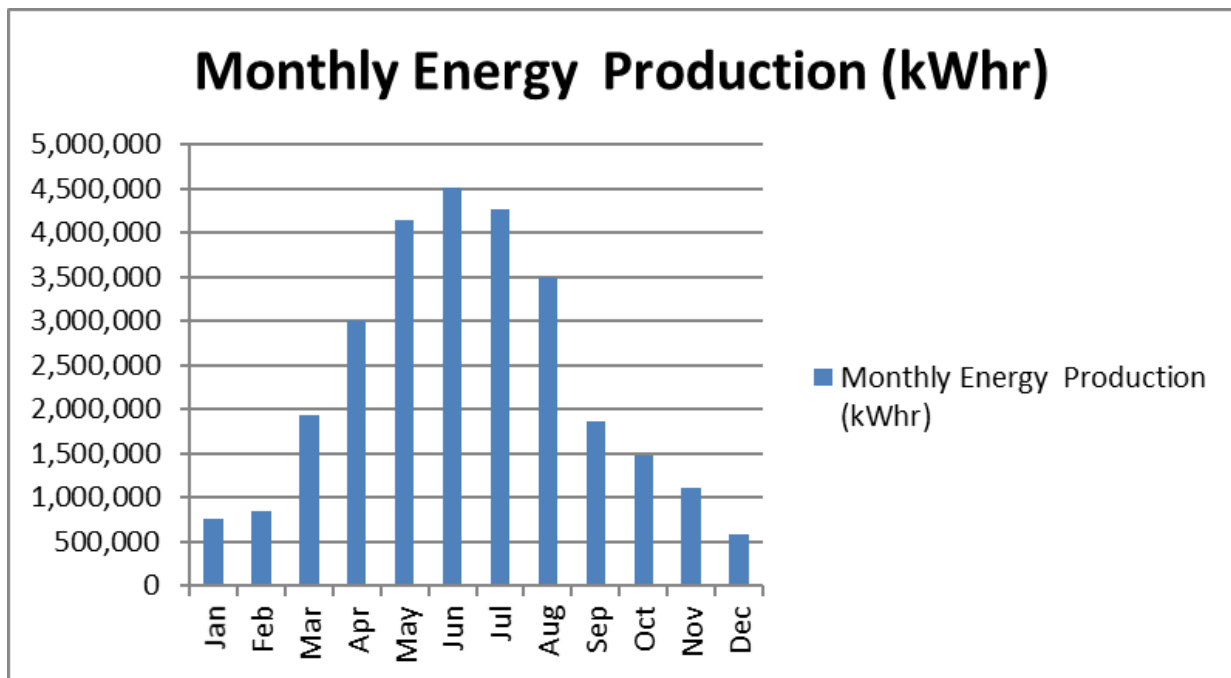


Figure 7
Average Monthly Power Production
Pueblo Dam Hydroelectric Project

Project Cost

The opinion of estimated project cost was determined based on an estimate prepared by Mountain States Hydro, LLC, turbine supplier quotes, and experience from previous hydro projects. Table 2 summarizes the major cost components.

Table 2
Project Cost Estimate
Pueblo Dam Hydroelectric Project

Item	Cost
Base Civil Works Construction Cost	\$ 5,804,000
Overhead and Administration	\$ 900,000
Profit	\$ 600,000
Construction Subtotal	\$ 7,304,000
Construction Contingency	\$ 1,800,000
Construction Total	\$ 9,104,000
Submittal Review and Design Support	\$ 110,000
SECWCD Construction Management	\$ 200,000
SECWCD Install Assistance	\$ 146,000

Electrical Interconnection	\$ 1,000,000
<u>Turbine/Generator/Controls</u>	<u>\$ 6,000,000</u>
Subtotal Project Cost	\$16,560,000
<u>1% Loan Fee</u>	<u>\$ 165,600</u>
Total Project Cost to be Financed	\$16,725,600

In addition to the above costs, the Enterprise has funded recent studies and costs on the project including:

- Reclamation Contributed Funds Act - \$50,000
- NEPA Studies, Applegate, 2012 - \$42,500
- Feasibility Study Update, CH2MHill, March 2014 - \$25,000
- Preliminary Design, CH2MHill, 2014 - \$245,000
- Pueblo County 1041 Reviews, 2014 - \$5,100
- Interconnection Study, Black Hills Energy, 2014 - \$22,000
- LOPP Survey and Legal Descriptions, 2015 - \$3,500
- Power Purchase Legal Assistance, 2015 - \$25,000
- Electrical Interconnection and Power Purchase Consulting, 2015 - \$25,000
- SECWCD Administration, 2012-2015 - \$650,000
- Design-Build Phase I Design - \$747,000

A total of \$1,840,000 will be committed by the Enterprise which is 10% of the total estimated project cost of \$18,400,000.

Financial Plan

The SECWCD Enterprise intends to utilize the CWCB Water Project Loan Program for financing of the PDHP construction. The loan would be entered into through Southeastern's Water Activity Enterprise. In order to make the project financially feasible, a 30-year term at 2% interest is necessary. For this reason, SECWCD is requesting a full loan amount through CWCB.

Cash Flow

A summary of the project cash flows is provided in Table 3. Table 4 shows the estimated summary of expenses and revenues by year for the term of the loan for the probable scenario. Table 5 shows the estimated summary for a conservative scenario with a higher project cost and lower production. The cash flows are based on the following assumptions:

- A 2 percent 30-year loan with a 1 percent origination fee and interest during construction rolled into the loan. The first payment would be due in the summer of 2019 after one year of operation.
- Power purchase agreement (PPA) with Colorado Springs Utilities. The terms of the PPA must meet or exceed the following criteria for the project to be financially feasible:
 - Achieve a Benefit/Cost Ratio (Net Present Value) greater than 1.0 and,

- Cumulative Net Cash Flow is always positive for any year of operation so that revenue reserves cover any years when expenses exceed revenues.

In order to meet the above criteria, the following power pricing must be achieved for the Power Purchase Agreement: Beginning power price of 5.2 cents/kWhr assuming a 2.50% escalation per year for the term of the agreement.

- Reclamation LOPP charge of 3 mills per kWhr escalating at 2 percent per year.
- Operations and maintenance cost of \$120,000 per year escalating at 2 percent per year.
- Repair and replacement fund of \$100,000 per year escalating at 2 percent per year.
- Purchase of firming power in the amount of \$125,000 per year escalating at 2 percent per year.
- Cash flow reserves will be used during any years when expenses exceed revenues during the loan period.

Table 3
Project Finance Summary
Pueblo Dam Hydroelectric Project

Item	Description
Installed KW	7,500
Annual Production (kWhrs)	28,000,000
Project Cost	\$18,400,000
Loan Amount	\$16,725,600 (including 1% loan fee)
Annual Revenue (first 10 years' average)	\$1,630,000
Net Average Price/kWhr	\$0.05825
Annual O&M (Estimated)	\$ 120,000
Annual R&R (Estimated)	\$ 100,000
Annual LOPP Charge	\$ 84,000
Loan Payment	\$ 746,797
Net Annual Revenue	\$ 286,200
50 Year Benefit/Cost Ratio (Net Present Value)	1.12
Internal Rate of Return (IRR)	18%

Table 4
Financial Analysis – Probable Scenario
Pueblo Dam Hydroelectric Project

Table 4 - Financial Analysis Probable Scenario										
		Assumptions			Escalation					
Planning and LoPP Costs	\$1,200,000	Average Annual Generation (kWhrs)	28,000,000	0.0%						
Construction Cost	\$16,400,000	Energy Price (cents/kWhr)	5.2	2.5%						
Contingency	\$800,000	Operations & Maintenance	\$120,000	3.0%						
Construction Cost	\$18,400,000	Repair and Replacement	\$100,000	2.0%						
90% Financed	\$16,560,000	BHE Distribution & Transmission	\$168,000	2.0%						
1% Loan Fee	\$165,600	USBR LoPP	\$84,000	2.0%						
Total Loan Amount	\$16,725,600	Firming Power	\$125,000	2.0%						
Loan Interest Rate	2%	Total Annual Costs	\$597,000							
Term (Years)	30									
Annual Payment	\$746,797	Total Annual Revenue	\$1,456,000	2.5%						
First Ten Years Payment	\$821,476									
Year	Generation (kWhr)	CWCB Payment	O&M	Repair & Replacement	BHE Dist & Transmission	USBR LoPP Payment	Firming Power	Total Annual Cost	Total Annual Revenue	Cummulative Revenue
2017	Construction									(\$1,840,000)
2018	28,000,000		\$120,000	\$100,000	\$168,000	\$84,000	\$125,000	\$597,000	\$1,456,000	(\$981,000)
2019	28,000,000	\$821,476	\$123,000	\$102,000	\$171,360	\$85,680	\$127,500	\$1,431,016	\$1,492,400	(\$919,616)
2020	28,000,000	\$821,476	\$126,075	\$104,040	\$174,787	\$87,394	\$130,050	\$1,443,822	\$1,529,710	(\$833,729)
2021	28,000,000	\$821,476	\$129,227	\$106,121	\$178,283	\$89,141	\$132,651	\$1,456,900	\$1,567,953	(\$722,675)
2022	28,000,000	\$821,476	\$132,458	\$108,243	\$181,849	\$90,924	\$135,304	\$1,470,254	\$1,607,152	(\$585,778)
2023	28,000,000	\$821,476	\$135,769	\$110,408	\$185,486	\$92,743	\$138,010	\$1,483,892	\$1,647,330	(\$422,340)
2024	28,000,000	\$821,476	\$139,163	\$112,616	\$189,195	\$94,598	\$140,770	\$1,497,819	\$1,688,514	(\$231,645)
2025	28,000,000	\$821,476	\$142,642	\$114,869	\$192,979	\$96,490	\$143,586	\$1,512,042	\$1,730,726	(\$12,960)
2026	28,000,000	\$821,476	\$146,208	\$117,166	\$196,839	\$98,419	\$146,457	\$1,526,566	\$1,773,995	\$234,468
2027	28,000,000	\$821,476	\$149,864	\$119,509	\$200,776	\$100,388	\$149,387	\$1,541,399	\$1,818,344	\$511,413
2028	28,000,000	\$821,476	\$153,610	\$121,899	\$204,791	\$102,396	\$152,374	\$1,556,547	\$1,863,803	\$818,670
2029	28,000,000	\$746,797	\$157,450	\$124,337	\$208,887	\$104,443	\$155,422	\$1,497,337	\$1,910,398	\$1,231,731
2030	28,000,000	\$746,797	\$161,387	\$126,824	\$213,065	\$106,532	\$158,530	\$1,513,135	\$1,958,158	\$1,676,754
2031	28,000,000	\$746,797	\$165,421	\$129,361	\$217,326	\$108,663	\$161,701	\$1,529,268	\$2,007,112	\$2,154,598
2032	28,000,000	\$746,797	\$169,557	\$131,948	\$221,672	\$110,836	\$164,935	\$1,545,745	\$2,057,290	\$2,666,143
2033	28,000,000	\$746,797	\$173,796	\$134,587	\$226,106	\$113,053	\$168,234	\$1,562,572	\$2,108,722	\$3,212,293
2034	28,000,000	\$746,797	\$178,141	\$137,279	\$230,628	\$115,314	\$171,598	\$1,579,756	\$2,161,440	\$3,793,977
2035	28,000,000	\$746,797	\$182,594	\$140,024	\$235,241	\$117,620	\$175,030	\$1,597,306	\$2,215,476	\$4,412,148
2036	28,000,000	\$746,797	\$187,159	\$142,825	\$239,945	\$119,973	\$178,531	\$1,615,229	\$2,270,863	\$5,067,781
2037	28,000,000	\$746,797	\$191,838	\$145,681	\$244,744	\$122,372	\$182,101	\$1,633,534	\$2,327,635	\$5,761,882
2038	28,000,000	\$746,797	\$196,634	\$148,595	\$249,639	\$124,820	\$185,743	\$1,652,228	\$2,385,826	\$6,495,480
2039	28,000,000	\$746,797	\$201,550	\$151,567	\$254,632	\$127,316	\$189,458	\$1,671,319	\$2,445,471	\$7,269,632
2040	28,000,000	\$746,797	\$206,589	\$154,598	\$259,725	\$129,862	\$193,247	\$1,690,818	\$2,506,608	\$8,085,422
2041	28,000,000	\$746,797	\$211,753	\$157,690	\$264,919	\$132,460	\$197,112	\$1,710,731	\$2,569,273	\$8,943,965
2042	28,000,000	\$746,797	\$217,047	\$160,844	\$270,217	\$135,109	\$201,055	\$1,731,068	\$2,633,505	\$9,846,401
2043	28,000,000	\$746,797	\$222,473	\$164,061	\$275,622	\$137,811	\$205,076	\$1,751,839	\$2,699,343	\$10,793,905
2044	28,000,000	\$746,797	\$228,035	\$167,342	\$281,134	\$140,567	\$209,177	\$1,773,052	\$2,766,826	\$11,787,679
2045	28,000,000	\$746,797	\$233,736	\$170,689	\$286,757	\$143,378	\$213,361	\$1,794,718	\$2,835,997	\$12,828,958
2046	28,000,000	\$746,797	\$239,579	\$174,102	\$292,492	\$146,246	\$217,628	\$1,816,845	\$2,906,897	\$13,919,010
2047	28,000,000	\$746,797	\$245,569	\$177,584	\$298,342	\$149,171	\$221,981	\$1,839,444	\$2,979,569	\$15,059,135
2048	28,000,000	\$746,797	\$251,708	\$181,136	\$304,309	\$152,154	\$226,420	\$1,862,524	\$3,054,058	\$16,250,670
2049	28,000,000	\$0	\$258,001	\$184,759	\$310,395	\$155,197	\$230,949	\$1,139,301	\$3,130,410	\$18,241,779
2050	28,000,000	\$0	\$264,451	\$188,454	\$316,603	\$158,301	\$235,568	\$1,163,377	\$3,208,670	\$20,287,072
2051	28,000,000	\$0	\$271,062	\$192,223	\$322,935	\$161,467	\$240,279	\$1,187,966	\$3,288,887	\$22,387,992
2052	28,000,000	\$0	\$277,839	\$196,068	\$329,394	\$164,697	\$245,085	\$1,213,081	\$3,371,109	\$24,546,020
2053	28,000,000	\$0	\$284,785	\$199,989	\$335,981	\$167,991	\$249,986	\$1,238,732	\$3,455,387	\$26,762,675
2054	28,000,000	\$0	\$291,904	\$203,989	\$342,701	\$171,351	\$254,986	\$1,264,931	\$3,541,771	\$29,039,516
2055	28,000,000	\$0	\$299,202	\$208,069	\$349,555	\$174,778	\$260,086	\$1,291,689	\$3,630,316	\$31,378,143
2056	28,000,000	\$0	\$306,682	\$212,230	\$356,546	\$178,273	\$265,287	\$1,319,018	\$3,721,074	\$33,780,198
2057	28,000,000	\$0	\$314,349	\$216,474	\$363,677	\$181,839	\$270,593	\$1,346,932	\$3,814,100	\$36,247,367
2058	28,000,000	\$0	\$322,208	\$220,804	\$370,951	\$185,475	\$276,005	\$1,375,443	\$3,909,453	\$38,781,377
2059	28,000,000	\$0	\$330,263	\$225,220	\$378,370	\$189,185	\$281,525	\$1,404,562	\$4,007,189	\$41,384,004
2060	28,000,000	\$0	\$338,519	\$229,724	\$385,937	\$192,969	\$287,156	\$1,434,305	\$4,107,369	\$44,057,068
2061	28,000,000	\$0	\$346,982	\$234,319	\$393,656	\$196,828	\$292,899	\$1,464,684	\$4,210,053	\$46,802,437
2062	28,000,000	\$0	\$355,657	\$239,005	\$401,529	\$200,764	\$298,757	\$1,495,712	\$4,315,305	\$49,622,029
2063	28,000,000	\$0	\$364,548	\$243,785	\$409,560	\$204,780	\$304,732	\$1,527,405	\$4,423,187	\$52,517,812
2064	28,000,000	\$0	\$373,662	\$248,661	\$417,751	\$208,875	\$310,826	\$1,559,776	\$4,533,767	\$55,491,803
2065	28,000,000	\$0	\$383,004	\$253,634	\$426,106	\$213,053	\$317,043	\$1,592,840	\$4,647,111	\$58,546,074
2066	28,000,000	\$0	\$392,579	\$258,707	\$434,628	\$217,314	\$323,384	\$1,626,611	\$4,763,289	\$61,682,752
2067	28,000,000	\$0	\$402,393	\$263,881	\$443,320	\$221,660	\$329,851	\$1,661,106	\$4,882,371	\$64,904,017
2068	28,000,000	\$0	\$412,453	\$269,159	\$452,187	\$226,093	\$336,449	\$1,696,341	\$5,004,430	\$68,212,106
							Net Present Value (NPV)	\$32,176,779	\$50,798,004	
							Benefit/Cost Ratio	1.58		
							IRR			18.04%

Table 5
Financial Analysis – Conservative Scenario
Pueblo Dam Hydroelectric Project

Table 5 - Financial Analysis Conservative Scenario										
		Assumptions			Escalation					
Planning and LoPP Cost	\$1,200,000	Average Annual Generation (kWhrs)			25,000,000	0.0%				
Construction Cost	\$18,400,000	Energy Price (cents/kWhr)			5.2	2.5%				
Contingency	\$800,000	Operations & Maintenance			\$120,000	3.0%				
Construction Cost	\$20,400,000	Repair and Replacement			\$100,000	2.0%				
90% Financed	\$18,360,000	BHE Distribution & Transmission			\$168,000	2.0%				
1% Loan Fee	\$183,600	USBR LoPP			\$84,000	2.0%				
Total Loan Amount	\$18,543,600	Firming Power			\$125,000	2.0%				
Loan Interest Rate	2%	Total Annual Costs			\$597,000					
Term (Years)	30									
Annual Payment	\$827,970	Total Annual Revenue			\$1,300,000	2.5%				
First Ten Years Paymen	\$910,767									
Year	Generation (kWhr)	CWCB Payment	O&M	Repair & Replacement	BHE Dist & Transmission	USBR LoPP Payment	Firming Power	Total Annual Cost	Total Annual Revenue	Cummulative Revenue
2017	Construction									(\$1,840,000)
2018	25,000,000		\$120,000	\$100,000	\$168,000	\$84,000	\$125,000	\$597,000	\$1,300,000	(\$1,137,000)
2019	25,000,000	\$910,767	\$123,000	\$102,000	\$171,360	\$85,680	\$127,500	\$1,520,307	\$1,332,500	(\$1,324,807)
2020	25,000,000	\$910,767	\$126,075	\$104,040	\$174,787	\$87,394	\$130,050	\$1,533,113	\$1,365,813	(\$1,492,108)
2021	25,000,000	\$910,767	\$129,227	\$106,121	\$178,283	\$89,141	\$132,651	\$1,546,190	\$1,399,958	(\$1,638,341)
2022	25,000,000	\$910,767	\$132,458	\$108,243	\$181,849	\$90,924	\$135,304	\$1,559,545	\$1,434,957	(\$1,762,929)
2023	25,000,000	\$910,767	\$135,769	\$110,408	\$185,486	\$92,743	\$138,010	\$1,573,183	\$1,470,831	(\$1,865,281)
2024	25,000,000	\$910,767	\$139,163	\$112,616	\$189,195	\$94,598	\$140,770	\$1,587,110	\$1,507,601	(\$1,944,790)
2025	25,000,000	\$910,767	\$142,642	\$114,869	\$192,979	\$96,490	\$143,586	\$1,601,333	\$1,545,291	(\$2,000,831)
2026	25,000,000	\$910,767	\$146,208	\$117,166	\$196,839	\$98,419	\$146,457	\$1,615,857	\$1,583,924	(\$2,032,764)
2027	25,000,000	\$910,767	\$149,864	\$119,509	\$200,776	\$100,388	\$149,387	\$1,630,690	\$1,623,522	(\$2,039,932)
2028	25,000,000	\$910,767	\$153,610	\$121,899	\$204,791	\$102,396	\$152,374	\$1,645,838	\$1,664,110	(\$2,021,660)
2029	25,000,000	\$827,970	\$157,450	\$124,337	\$208,887	\$104,443	\$155,422	\$1,578,510	\$1,705,713	(\$1,894,458)
2030	25,000,000	\$827,970	\$161,387	\$126,824	\$213,065	\$106,532	\$158,530	\$1,594,308	\$1,748,355	(\$1,740,411)
2031	25,000,000	\$827,970	\$165,421	\$129,361	\$217,326	\$108,663	\$161,701	\$1,610,442	\$1,792,064	(\$1,558,788)
2032	25,000,000	\$827,970	\$169,557	\$131,948	\$221,672	\$110,836	\$164,935	\$1,626,919	\$1,836,866	(\$1,348,841)
2033	25,000,000	\$827,970	\$173,796	\$134,587	\$226,106	\$113,053	\$168,234	\$1,643,745	\$1,882,788	(\$1,109,799)
2034	25,000,000	\$827,970	\$178,141	\$137,279	\$230,628	\$115,314	\$171,598	\$1,660,930	\$1,929,857	(\$840,871)
2035	25,000,000	\$827,970	\$182,594	\$140,024	\$235,241	\$117,620	\$175,030	\$1,678,480	\$1,978,104	(\$541,247)
2036	25,000,000	\$827,970	\$187,159	\$142,825	\$239,945	\$119,973	\$178,531	\$1,696,403	\$2,027,556	(\$210,093)
2037	25,000,000	\$827,970	\$191,838	\$145,681	\$244,744	\$122,372	\$182,101	\$1,714,707	\$2,078,245	\$153,445
2038	25,000,000	\$827,970	\$196,634	\$148,595	\$249,639	\$124,820	\$185,743	\$1,733,401	\$2,130,201	\$550,245
2039	25,000,000	\$827,970	\$201,550	\$151,567	\$254,632	\$127,316	\$189,458	\$1,752,493	\$2,183,456	\$981,208
2040	25,000,000	\$827,970	\$206,589	\$154,598	\$259,725	\$129,862	\$193,247	\$1,771,991	\$2,238,043	\$1,447,260
2041	25,000,000	\$827,970	\$211,753	\$157,690	\$264,919	\$132,460	\$197,112	\$1,791,905	\$2,293,994	\$1,949,349
2042	25,000,000	\$827,970	\$217,047	\$160,844	\$270,217	\$135,109	\$201,055	\$1,812,242	\$2,351,344	\$2,488,451
2043	25,000,000	\$827,970	\$222,473	\$164,061	\$275,622	\$137,811	\$205,076	\$1,833,013	\$2,410,127	\$3,065,566
2044	25,000,000	\$827,970	\$228,035	\$167,342	\$281,134	\$140,567	\$209,177	\$1,854,226	\$2,470,381	\$3,681,720
2045	25,000,000	\$827,970	\$233,736	\$170,689	\$286,757	\$143,378	\$213,361	\$1,875,891	\$2,532,140	\$4,337,969
2046	25,000,000	\$827,970	\$239,579	\$174,102	\$292,492	\$146,246	\$217,628	\$1,898,018	\$2,595,444	\$5,035,394
2047	25,000,000	\$827,970	\$245,569	\$177,584	\$298,342	\$149,171	\$221,981	\$1,920,617	\$2,660,330	\$5,775,107
2048	25,000,000	\$827,970	\$251,708	\$181,136	\$304,309	\$152,154	\$226,420	\$1,943,698	\$2,726,838	\$6,558,247
2049	25,000,000	\$0	\$258,001	\$184,759	\$310,395	\$155,197	\$230,949	\$1,139,301	\$2,795,009	\$8,213,955
2050	25,000,000	\$0	\$264,451	\$188,454	\$316,603	\$158,301	\$235,568	\$1,163,377	\$2,864,884	\$9,915,462
2051	25,000,000	\$0	\$271,062	\$192,223	\$322,935	\$161,467	\$240,279	\$1,187,966	\$2,936,506	\$11,664,002
2052	25,000,000	\$0	\$277,839	\$196,068	\$329,394	\$164,697	\$245,085	\$1,213,081	\$3,009,919	\$13,460,840
2053	25,000,000	\$0	\$284,785	\$199,989	\$335,981	\$167,991	\$249,986	\$1,238,732	\$3,085,167	\$15,307,274
2054	25,000,000	\$0	\$291,904	\$203,989	\$342,701	\$171,351	\$254,986	\$1,264,931	\$3,162,296	\$17,204,640
2055	25,000,000	\$0	\$299,202	\$208,069	\$349,555	\$174,778	\$260,086	\$1,291,689	\$3,241,353	\$19,154,305
2056	25,000,000	\$0	\$306,682	\$212,230	\$356,546	\$178,273	\$265,287	\$1,319,018	\$3,322,387	\$21,157,673
2057	25,000,000	\$0	\$314,349	\$216,474	\$363,677	\$181,839	\$270,593	\$1,346,932	\$3,405,447	\$23,216,188
2058	25,000,000	\$0	\$322,208	\$220,804	\$370,951	\$185,475	\$276,005	\$1,375,443	\$3,490,583	\$25,331,328
2059	25,000,000	\$0	\$330,263	\$225,220	\$378,370	\$189,185	\$281,525	\$1,404,562	\$3,577,848	\$27,504,613
2060	25,000,000	\$0	\$338,519	\$229,724	\$385,937	\$192,969	\$287,156	\$1,434,305	\$3,667,294	\$29,737,602
2061	25,000,000	\$0	\$346,982	\$234,319	\$393,656	\$196,828	\$292,899	\$1,464,684	\$3,758,976	\$32,031,895
2062	25,000,000	\$0	\$355,657	\$239,005	\$401,529	\$200,764	\$298,757	\$1,495,712	\$3,852,951	\$34,389,133
2063	25,000,000	\$0	\$364,548	\$243,785	\$409,560	\$204,780	\$304,732	\$1,527,405	\$3,949,274	\$36,811,002
2064	25,000,000	\$0	\$373,662	\$248,661	\$417,751	\$208,875	\$310,826	\$1,559,776	\$4,048,006	\$39,299,233
2065	25,000,000	\$0	\$383,004	\$253,634	\$426,106	\$213,053	\$317,043	\$1,592,840	\$4,149,206	\$41,855,599
2066	25,000,000	\$0	\$392,579	\$258,707	\$434,628	\$217,314	\$323,384	\$1,626,611	\$4,252,936	\$44,481,924
2067	25,000,000	\$0	\$402,393	\$263,881	\$443,320	\$221,660	\$329,851	\$1,661,106	\$4,359,260	\$47,180,078
2068	25,000,000	\$0	\$412,453	\$269,159	\$452,187	\$226,093	\$336,449	\$1,696,341	\$4,468,241	\$49,951,979
Net Present Value (NPV)								\$33,589,755	\$45,355,361	
Benefit/Cost Ratio IRR								1.35		9.21%

Collateral

The collateral of the project will be a pledge of the net revenue of the project. Net revenue is defined as the gross revenue (power purchase agreement payment) less operating costs. The initial power purchase agreement with the power purchaser will be for 10 years with a 10-year exhibit extension under the General Services Agreement between CSU and Fort Carson. This essentially extends the contract to a 20-year period. The contract can be extended for additional ten year periods by agreement of all parties based on negotiated terms of the PPA. By year 20, the annual average revenue will exceed estimated costs by approximately \$730,000 which will cover the estimated annual CWCB loan payment of \$746,797. The balance of the payment could be covered by Enterprise reserves.

Project Schedule

The estimated project schedule is shown in Table 6. The near term schedule is to finalize the LOPP, finalize negotiations of the Power Purchase Agreement, and close on the project loan by September 2016. A design-build contract will be completed in June, 2016 with a Guaranteed Maximum Price (GM) or lump sum contract negotiated by September, 2016. The turbine equipment would be ordered by the Fall of 2016. The powerhouse and penstock would be constructed from early 2017 to Spring 2018 and the project would be operational by May 2018.

TABLE 6
Preliminary Development Schedule
Pueblo Dam Hydroelectric Project

Milestone	Date
Develop Design-Build GMP/Lump Sum Contract	June 2016 – September, 2016
Equipment Procurement Document Development	June 2016 – September, 2016
Execution of the Lease of Power Privilege Contract	August 2016
Execution of Power Sales and Interconnection Agreements	August 2016
Procurement of Hydroelectric Equipment	September 2016 – Oct 2016
Negotiate and Award of Hydroelectric Equipment Contract	October 2016 – Nov 2016
Equipment Submittals	November 2016 – June 2017
Equipment Manufacture and Delivery`	February 2018
Power Plant Construction	October 2016 – January 2018
Commissioning	May 2018

Conclusions and Recommendations

The SECWCD and project partners believe that the Pueblo Dam Hydroelectric Project is both technically and economically feasible. Colorado Springs Utilities has the necessary staff to ensure that the facility is maintained and operated in an exceptional manner. The engineering work performed by CH2MHill and Mountain States Hydro, LLC demonstrate the technical feasibility of the project. The design-build process will establish the total project costs before construction begins. Finally, based on the financial criteria needed for a power purchase agreement compared to prevailing market pricing, the project will be able to repay the loan and has the potential to accumulate excess revenue.